



Space Missions and Information Technology: *Some Thoughts and Highlights*

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***2nd International Conference on
Space Mission Challenges for Information Technology (SMC-IT)
Pasadena, California USA***

July 19, 2006

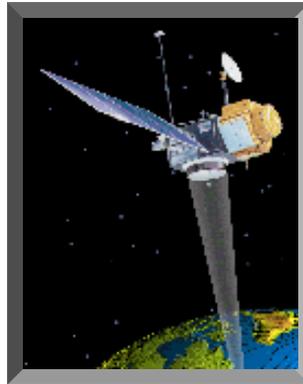


Where is the IT on Space Missions?

Mars and Planetary Missions



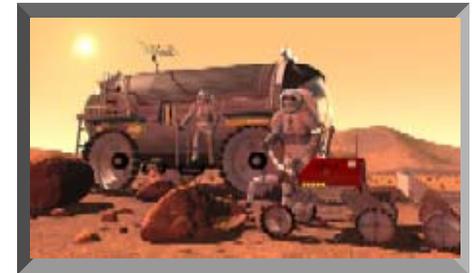
Earth Observing Missions



Astrophysics Missions



Human Exploration Missions



Flight Systems

Mission Planning & Execution -- Science Data Processing & Event Detection -- Model-based Fault Management -- Control Architectures -- Computing Architectures -- Autonomy for EDL -- Autonomous Navigation -- Autonomy for Surface Operations -- Human-Robotic Interfaces -- SW Reliability

Space Communications

Space-based Protocols -- Data Compression -- Downlink Prioritization -- Space-based Networking -- Relays -- Demand Access -- Multi-Platform Coordination

Ground Systems

Ground System Automation -- Mission Planning & Execution -- Modeling & Simulation -- Design Exploration -- High-Capability Computing -- Data Analysis, Visualization & Management -- SW Engineering -- Virtual Environments





Winners of the NASA Software of the Year Award

- Winners in 2003
 - SeaWIFS Data Analysis System (SeaDAS) - GSFC
 - Data Analysis, Visualization & Management
 - NASGRO Fracture Mechanics Analysis Software - JSC
 - Modeling & Simulation
- Winners in 2004
 - Science Activity Planner (SAP) - JPL
 - Mission Planning & Execution
 - TetrUSS 2004 - LaRC
 - Modeling & Simulation
- Winners in 2005
 - Autonomous Sciencecraft Experiment (ASE) - JPL
 - Mission Planning & Execution, Science Data Analysis & Event Detection
 - Land Information System (LIS) v. 4.0 - GSFC
 - Modeling & Simulation, Data Analysis, Visualization & Management

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



Space Networking Roadmap



2005 2010 2015 2020 2025 2030



Reliable multi-hop links; publish / subscribe capability for MSL

Reliable multi-route relays; DTN needed for Lunar Exploration

Automated routing protocols; congestion control

Automatically managed quality of service transmissions; autonomous network administration

Extended mission use of science event detection

Routine use of onboard data analysis and decision making

Autonomous coordination of multiple assets for collaborative observations

Autonomous performance of science campaigns requiring multiple assets

Network Ops

Science Ops



10 (7) - Year Vision for IT in Space

3

- *Mission software is reliable and reusable, with predictable effort and cost*

4

- *Software-based capabilities enable space platforms with new onboard capabilities and long-term survivability*

5

- *The Interplanetary Network is achieved, with routine robust access to space information products by PI's and the general public, as well as information sharing among space assets*

3

- The role of software, information technology and computing in space mission success is known and valued

2

- Flight Project Managers routinely come from IT backgrounds as well as traditional engineering backgrounds